A *Superior* Research Reader

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Photo Credit: The Duluth Tribune, HOCP, Voyageurs National Park

Greetings and welcome to A *Superio*r Research Reader, a monthly reader on what we believe is current and relevant research to science and resource management on the Superior.

This Month's Edition: Heart of the Continent

After the 1st Annual Heart of the Continent Partnership (HOCP) Science Symposium held earlier this month in International Falls, MN, we decided to highlight some of the incredible research that land managers and local stakeholders are working together on. These are cross-border projects that promote the economic, cultural, and natural health of the lakes, forests, and communities within the 5.5 million acre landscape that makes up the Heart. The Heart is comprised of a blend of working forests, rugged scenery, pristine watersheds, abundant wildlife and outstanding biodiversity. Several separately managed natural areas are encompassed by this ecosystem, including Quetico Provincial Park, Superior National Forest (and the BWCAW), Voyageurs National Park, Grand Portage National Monument and numerous Minnesota state forest lands and parks and Ontario provincial parks. This one-day event included research from cultural, social and natural science fields. Enjoy a taste of the exciting work what was shared at the successful 1st annual HOCP Science Symposium!

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1. Forest disturbance and recovery patterns in the Border Lakes are explored by our friends at the Northern Research Station and Iowa State University. Their symposium presentations focused on spruce budworm.

2. Tom Myers described a watershed-scale groundwater fate and transport model for the Rainy Headwaters that examines acid mine drainage risks to mining facilities in Northern Minnesota.

3. The latest publication in the ongoing USGS research concerning white-tailed deer fawn risk from gray wolf predation during the summer was showcased as a poster presentation during the Symposium.

4. Superior's very own Lee Johnson, along with peers from the University of Wisconsin and the University of Minnesota, presented brand new research on culturally-modified Red Pine. While his work is in the final stages of publication, here is an article from his academic collaborators exploring the decline and long-term dynamics of whitebark pine communities.

Forest recovery patterns in response to divergent disturbance regimes in the Border Lakes region of Minnesota (USA) and Ontario (Canada) Sturtevant et al. 2014. Forest Ecology and Management.

ABSTRACT: The persistence of landscape-scale disturbance legacies in forested ecosystems depends in part on the nature and strength of feedback among disturbances, their effects, and subsequent recovery processes such as tree regeneration and canopy closure. We investigated factors affecting forest recovery rates over a 25-year time period in a large (6 million ha) landscape where geopolitical boundaries have resulted in important land management legacies (managed forests of Minnesota, USA; managed forests of Ontario, Canada; and a large unmanaged wilderness). Stand-replacing disturbance regimes were quantified across management zones, both inside and outside a central ecoregion, using a time series of classified land cover data constructed at 5-year intervals between 1975 and 2000. The temporally variable disturbance regime of the wilderness was characterized by fine-scaled canopy disturbances punctuated by less frequent large disturbance events (i.e., fire and blow down). We conclude that the magnitude of divergence in landscape disturbance legacies of this region will be additionally reinforced by regional variations in the human and natural disturbance regimes and their interactions with forest recovery processes. Our analyses compliment traditional plot-scale studies that investigate post-disturbance recovery by (a) examining vegetation trends across a wide range of variability and (b) quantifying the cumulative effects of disturbances as they affect recovery rates over a broad spatial extent.

Acid mine drainage risks – A modeling approach to siting mine facilities in Northern Minnesota USA
Myers, Tom. 2016. Journal of Hydrology.

ABSTRACT: Most watershed-scale planning for mine-caused contamination concerns remediation of past problems while future planning relies heavily on engineering controls. As an alternative, a watershed scale groundwater fate and transport model for the Rainy Headwaters, a northeastern Minnesota watershed, has been developed to examine the risks of leaks or spills to a pristine downstream watershed. The model shows that the risk depends on the location and whether the source of the leak is on the surface or from deeper underground facilities. Underground sources cause loads that last longer but arrive at rivers after a longer travel time and have lower concentrations due to dilution and attenuation. Surface contaminant sources could cause much more short-term damage to the resource. Because groundwater dominates baseflow, mine contaminant seepage would cause the most damage during low flow periods. Groundwater flow and transport modeling is a useful tool for decreasing the risk to downgradient sources by aiding in the placement of mine facilities. Although mines are located based on the minerals, advance planning and analysis could avoid siting mine facilities where failure or leaks would cause too much natural resource damage. Watershed scale transport modeling could help locate the facilities or decide in advance that the mine should not be constructed due to the risk to downstream resources.

White-tailed Deer (Odocoileus virginianus) Fawn Risk from Gray Wolf (Canis lupus) Predation During Summer
Mech et al. 2015. Canadian Field-Naturalist

ABSTRACT: Little is known about how often various prey animals are at risk of predation by Gray Wolves (Canis lupus). We used a system to monitor the presence during the day of two radio-collared Gray Wolves within 2 km of a radio-collared White-tailed Deer (Odocoileus virginianus) with a fawn or fawns in August 2013 in the Superior National Forest of northeastern Minnesota. We concluded that the fawn or fawns were at risk of predation by at least one wolf at least daily.

Ecological Disaster or the Limits of Observation? Reconciling Modern Declines with the Long-Term Dynamics of Whitebark Pine Communities Larson and Kipfmueller. 2012. Geography Compass.

ABSTRACT: The history of whitebark pine (Pinus albicaulis) forests over the past century exemplifies modern environmental change and the particular challenges faced in reconciling the scales of human observation with long-term ecological changes. A number of factors are implicated in driving observed declines in whitebark pine populations including fire suppression, climate change, the exotic pathogen Cronartium ribicola and associated white pine blister rust, and mountain pine beetle (Dendroctonus ponderosae) outbreaks, yet the actual effects of these factors vary widely across the range of whitebark pine that encompasses considerable environmental heterogeneity. Furthermore, the specific effects of these agents are difficult to isolate or predict in a forest type where disturbance regimes and succession operate on scales of centuries rather than decades. The resulting situation is highly complex, yet the urgency for restoration in some areas is leading to generalizations elsewhere that do not always account for the diversity of forests considered as whitebark pine communities. Our research reviews the current state of knowledge on the biogeography, disturbance regimes, and mechanisms of decline in whitebark pine communities. We then use an expanded temporal perspective based on dendroecological case studies to critically assess the potential effects of fire suppression in whitebark pine communities and the ecological relationship between whitebark pine and mountain pine beetle. Based on our findings, it appears that fire suppression is not the ubiquitous factor leading to whitebark pine declines, as often implicated in the published literature, and that whitebark pine may be well adapted to recover following mountain pine beetle outbreaks in areas that have not been impacted too severely from white pine blister rust.